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Claims

[c1] 1. A method for altering a surface feature of an existing pattern on a substrate, said method comprising
(a) delivering a chemical to a site proximate to a target feature to be altered, and
(b) providing activating energy at said site whereby a chemical reaction and/or milling occurs,
wherein said chemical delivery and/or said providing of energy occurs only locally at said site whereby said chemical reaction and/or milling occurs only locally to said site, said reaction and/or milling resulting in alteration of said feature.

[c2] 2. The method of claim 1 wherein said chemical is delivered locally to said site.

[c3] 3. The method of claim 2 wherein said delivery is performed by passing said chemical through a probe tip channel having an opening placed proximate to said site.

[c4] 4. The method of claim 2 wherein said delivery is performed by placing a probe tip coated with said chemical proximate to said site.

[c5] 5. The method of claim 1 wherein said delivery is performed by providing a fluid containing said chemical at said site.

[c6] 6. The method of claim 1 wherein said activating energy is provided by illuminating a probe tip proximate to said site.

[c7] 7. The method of claim 6 wherein said probe comprises a non-metal portion and a metal apex portion which causes localized scattering of photons at said site resulting in near-field electromagnetic field amplification.

[c8] 8. The method of claim 7 wherein said apex is illuminated with an energy source of wavelength at least about ten times greater than a diameter of said apex.

[c9] 9. The method of claim 6 wherein said probe tip comprises at least two electrodes with a gap there between and said illumination energy comprises coherent radiation at two wavelengths whereby interaction between said electrodes and said illumination energy causes formation of a plasma between said electrodes.

[c10] 10. The method of claim 2 wherein said activation energy is provided by directing far-field energy selected from the group consisting of light, electron beam and ion beam.

[c11] 11. The method of claim 1 wherein a second chemical is provided for assisting in said reaction.

[c12] 12. The method of claim 1 wherein said activation energy is provided in the form of a beam and said reaction is locally confined to an area narrower than a diffraction limit of said beam.

[c13] 13. The method of claim 5 wherein said chemical includes an illumination sensitive material and said illumination sensitive material is protected from said illuminating while being delivered.

[c14] 14. The method of claim 7 wherein said scattering results in the imparting of thermal energy to said substrate at said site.

[c15] 15. The method of claim 5 wherein said chemical is provided as an ambient in a process chamber in which said substrate is placed.

[c16] 16. The method of claim 5 wherein said chemical is provided as a flow directed towards said site.

[c17] 17. A system for altering a micron-scale or nanometer-scale surface feature of an existing pattern on a substrate, said system comprising:
(a) a probe maneuverable to a site proximate to a target

feature to be altered,

(b) a chemical source adapted to provide delivery of a chemical to said site proximate to a target feature to be altered, and

(c) a energy source for providing activating energy at said site,

wherein said chemical source is capable only of local chemical delivery and/or said energy source is capable of providing of energy only locally at said site.

[c18] 18. The system of claim 17 wherein said energy source is capable of providing activation energy sufficient to cause a chemical reaction and/or milling only locally to said site, said reaction and/or milling resulting in alteration of said feature.

[c19] 19. The system of claim 17 wherein said energy source is a source of far-field energy selected from the group consisting of light, electron beam and ion beam.

[c20] 20. The system of claim 17 wherein said chemical source comprises a channel in said probe for delivering said chemical.

[c21] 21. The system of claim 17 wherein said chemical source comprise a component from which at least a tip of said probe is made.

[c22] 22. The system of claim 17 further comprising a source of a second chemical for providing said second chemical at said site.

[c23] 23. The system of claim 17 wherein said probe includes an opaque coating such that said probe shields said chemical from said activation energy while said chemical is being delivered to said site.

[c24] 24. The system of claim 17 wherein said probe comprises a nonmetallic probe body and a metal-containing apex.

[c25] 25. The system of claim 24 wherein said energy source is capable of providing energy incident to said apex, and wherein said energy has a wavelength at least about ten times greater than a diameter of said apex wherein incidence of such energy causes localized scattering and/or localized electromagnetic fields at said site.

[c26] 26. The system of claim 19 wherein source of activating energy includes a far-field source comprising one or more wavelengths selected from the range consisting of infrared to ultraviolet.

[c27] 27. The system of claim 24 wherein said apex includes one or more electrodes for coupling to one or more re-

spective sources of potential.

[c28] 28. The system of claim 17 wherein said probe comprises an apex including at least two open electrodes spaced by a gap, and said source of activating energy is capable of providing coherent radiation at two wavelengths whereby interaction between said electrodes and said activating energy causes formation of a plasma between said electrodes.

[c29] 29. The system of claim 28 wherein said energy source includes a laser and a light guide in or attached to said probe, said light guide being adapted to guide light from said laser to said gap.

[c30] 30. The system of claim 29 w rein said light guide is adapted to guide a first wavelength of said coherent radiation, and said energy source further includes an unguided beam adapted to illuminate said gap with a second wavelength of said coherent radiation.